

P. 77

NASA STI PROGRAM \_\_\_\_\_  
**COORDINATING COUNCIL**

Fifth Meeting \_\_\_\_\_ JULY 1, 1991

## QUALITY

(NASA-TM-108018) COORDINATING  
COUNCIL. FIFTH MEETING: QUALITY  
(NASA) 77 p

N93-12659

Unclass

63/92 012659





# **NASA STI PROGRAM**

**Coordinating Council  
Fifth Meeting**

**QUALITY**

**July 1, 1991**



NASA STI PROGRAM COORDINATING COUNCIL  
Fifth Meeting: **QUALITY**  
July 1, 1991

**AGENDA**

- 1:00 - 2:00           How Much Quality Can You Pay For?  
                          Bonnie Carroll, *Information International*
- 2:00 - 2:45           What CASI Has Done To Improve Quality  
                          Joe Gignac, Dian Marincola, *CASI*
- 3:00 - 3:45           Quality from the User Standpoint  
                          George Roncaglia, *LaRC*
- 3:45 - 4:30           Database Quality: User Views Test Producer Perception  
                          Barbara Lawrence, *AIAA*
- 4:30 - 5:00           Group Discussion

STI Conference Room, Suite 1300, Crystal Gateway II, 1225 Jefferson Davis Highway,  
Arlington, VA

**ATTENDEES**

**NTT**

Lisa Burdick  
James Erwin  
Curtis Generous  
Karen Kaye  
Allan Kuhn  
Tom Lahr  
Elizabeth Nestor  
Ann Normyle  
Roland Ridgeway  
Karen Simon  
Ardeth Taber  
Phil Thibideau  
Kay Voglewede  
John Wilson

**CASI**

Lee Blue  
Joe Gignac  
Georgiana Lira  
Dian A. Marincola  
Jean Tolzman

**AIAA**

Cort Durocher  
Barbara Lawrence  
Tony Lenti  
Geoff Worton

**Information International**

Bonnie C. Carroll



## **NASA STI Program Coordinating Council Improving Quality Assurance**

### *How much Quality Can You Pay For?* **Bonnie C. Carroll**

How much quality are you willing to pay for? First let's define quality. Quality is relative excellence, value for money, conformance to drawings and specifications, conformance to the purchase order, and fitness for intended function or use. There's nothing absolute about all of these definitions. You have to create your own criteria for measuring quality.

There has been an evolution in thinking about quality control. People used to look at quality control as statistical stamping, as asking at the end of the process, How good is the product? - then going back and fixing it. That's quality assurance. But you need to know your operating procedures, you need to see the whole system, and you need to engineer the criteria and work processes in the beginning so that you will have fewer remakes at the end. You can combine quality assurance with quality control. This thinking evolved into total quality management (TQM) and that then to a continuous improvement process. It's a different way of thinking about the whole notion of quality; it's less statistical methods and product orientation and looking more at a people orientation and an empowerment of individuals to affect the work that they're doing. This is the theme of TQM today.

#### Quality in Databases

What are the quality aspects of databases? At the very elementary level you have typographical quality - how accurate is it? Then you have the content quality of the record, scope and coverage (fitness for intended use), timeliness, and accessibility.

#### Quality in the STI Program

What are the quality issues in the STI Program? The issues are: internationally, we are getting beat; from a NASA perspective, the STI Program is not being used to the extent that we would like; individually, we're not happy as employees, we're not pulling together as a team, we're not being fulfilled.

#### The Deming Philosophy

In the 1940s, W. Edwards Deming was a teacher of statistical techniques. He came from a very humble beginning; he had put himself through college. He believed that statistics were the solution to many industry problems. He taught statistical techniques to American government and industry in the '40s. After the war, the United States wasn't interested in Deming and his ideas. So he went to Japan at their invitation. There, he got 21 Japanese businessmen to sit around the table and buy in to his concepts of total

quality management. He initiated a new order in Japan - how to manage quality. The Japanese spent from the early '50s to the '80s preparing themselves to start beating us in the marketplace. In 1980, Deming was on the NBC program "60 Minutes," saying "If Japan can do this, why can't we?" This presentation inspired the President of Ford, Donald Peterson, to call Deming and invite him into his office. Deming changed Ford's corporate culture to "quality is number one," and thereafter a lot of other industries committed themselves to this whole philosophy of total quality management.

What are Deming's main points? He has fourteen points; this is a summary.

Quality can cost less because you design it in rather than inspect it in. Current thinking about quality is that you have to constantly improve.

You have to create a constancy of purpose. It means staying ahead of the customer, not only in meeting present needs but planning for future needs as well. That's been the success of many U.S. industries; they have integrated total quality management into their business. Quality creates a new economic age for the today's single global market.

Mass inspection alone does not produce quality. Buying from the lowest bidder can be costly. Instead, to get supplies, according to Deming's philosophy, you work with a single supplier to improve quality and lower the supplier's costs, and in that development of a long-term relationship, all parties profit. This is a concept he promotes specifically, and of course the government acquisitions and contracting process tends to mitigate in a very different direction.

When you work with the supplier, you get high quality the first time, which prevents the costly errors found later in the cycle. Deming makes the point that you want to develop a new basis of incentives. The way government contracts are awarded, by cost control, we're monitoring the wrong things for what we're trying to accomplish. You've got to change your philosophy and allow new kinds of contracting relationships so that you are paying people not just to meet budget and production quota but to do the right thing. If you can come up with minimum optimal specifications, you could in fact reduce costs.

There are three rules of total quality management. The first isn't Deming's philosophy. You have to focus the organization's energy on one single thing: total customer satisfaction. Don't look at the product or the service, you're looking at whether the customer is satisfied. Everyone on the production line needs to have this focus. Everyone needs to think, "What does this thing I'm doing have to do with achieving customer satisfaction?" - your ultimate measure. And if the answer is "Nothing," then find a way not to do it.

Organize all work as a process. Focus on improving the process, not on the end result. If you do it right every step along the way, the end result is going to be right. That is the current Deming TQM philosophy.



The third point is give people a chance to seek continuous improvement for themselves and for the organization.

In the service industry, quality is more difficult to measure. Therefore, it's more difficult to comprehend this process. Customers don't evaluate only on the service outcome. They also look at the process of delivering. If they get an article that is great, they focus on that and are pleased, but if they went through a hassle to try to get it, then the service quality is rated lower and their total impression is of lack of quality. The only criteria that count are the ones that are defined by the customers. If we're abstracting or indexing and we're engineering in quality and the users never see it, they won't care about that quality if it doesn't contribute to what they see and their perception that it meets their needs. We have to have good authority files and so on that the users may not see, but we do have to think in terms of what the users are using that is important to them. Therefore, where do we put our emphasis in engineering quality? For instance, in looking at user friendliness and access, accessibility has been mentioned as an important value-added quality aspect of a database.

Service quality is defined as the discrepancy between customers' expectations or desires and their perception. Service expectations are formed by word-of-mouth communication, personal needs, past expectations, and external communications like advertising and literature. These factors define what the customer is looking for, what the perception is. The criteria that the customers use are tangible things: ease of communication, reliability, responsiveness - willingness to help customers and provide prompt service, competence - possession of the required skills, courtesy, credibility, security - freedom from danger or risk, access, communication - keeping the customer informed, understanding the customer - making the effort to know customers and their needs. There is a model that shows your expected service needs or personal needs. Your perceived service comes from expectations, and service quality is the net difference between the two. There is a standard methodology. Another model factors out from those original 10 dimensions of quality five things: tangibles, reliability, responsiveness, assurance, and empathy. These five items relate to the criteria we developed for database quality: access, responsiveness, and so on.

In the Deming method, the bottom line is that TQM changes your relationship with customers, with suppliers, and with employees. This is a continuing theme. All of these, your external markets and your internal staff are also your customers; everybody on the assembly line is the customer for the next person; and your suppliers are also your customers in a sense that you need to negotiate with them.

The pitfalls are that managers don't understand economics, capacities, bottlenecks, and sources of delay. Do your management reports give you the data that you need to know what your economics, capacities, bottlenecks, and your sources of delay are? Some of the literature from the defense industry looks very specifically at the problems inherent in that industry where there is a lot of government contracting. Contracting relationships

focus on the wrong measures: cost recovery, not working together as a team to end up with satisfied customers. The fault is partly in the system - but if you can get supplier and contractor behavior to be quality-oriented and begin to develop a common understanding, then successful TQM programs find ways to recast all this reporting to truly reflect operating requirements. And you have to sit down and roll up your sleeves and develop a common understanding. You have to avoid over- or under-specification because it is costly and the only way to do that is when you understand what is targeted.

Other pitfalls are that philosophies tell you to put quality in at the beginning, engineer it in, design it in, but your process is already in place. So how do you go back and retrofit? Retrofitting is very expensive. Also, you cannot automate your way to quality. You can become much more efficient but adding quality to the wrong processes is not the solution. Automation itself is not the solution. The "cruise control syndrome" addresses the lack of cross-functional integration. Something that is everybody's interest, is nobody's interest, and quality problems result from decisions never made. That's STI's problem. A problem that is pervasive throughout the whole research and development system is nobody's problem. And yet if you look at the whole research and development system in a TQM context, you see that most of the processes that scientists and engineers go through are information processes. If information is part of every critical process, it really needs to be looked at more seriously. Embracing statistical process control is only one dimension in only one dimension.

Another pitfall is paperwork and bureaucratizing the quality process. Successful total quality companies use less paper in their programs. TQM needs to be internal, individualized, and universal. No single action can replicate the accomplishments of the total quality company. Total quality is many small changes in culture. This speaks to competition, that comes later, but competitors can't just jump in and catch up to a TQM company. TQM is a philosophy, a way of doing business, not just quick changes. And finally, visions don't translate into action until workers understand the concrete changes required of them. People have to know how to use existing skills differently and how to gain new skills. The process really needs to be top down until the last person on the chain really understands.

A United Auto Workers spokesman gets to the heart of the personal point of view: "No one likes to go home and say they made junk all day." That's at the heart of TQM. People become proud and interested; you're on your way to a quality company.

There is a pyramid called the thought paradigm. From the top down are the top dog, vice presidents, middle managers, supervisors, and the workforce. Draw a line right above the workforce, and the people above the line are regarded as people who can think. People below the line are regarded as those who don't or can't think. The whole concept of quality control says, erase this line. That's basic to this whole quality concept.

### Conflict

GSA has a workbook that looks at one way to implement TQM. It says that when you have quality teams and you try to empower people and have everyone involved, there are many opportunities for conflict. There are different types of conflict. One is differences in data or in information. A conflict based on having different data is an easy conflict to resolve because you can look at the data and deal with it. Strategy conflicts get a little bit more complex because strategy is less concrete. Strategy has to come from management, there has to be understanding and acceptance, so you get into more difficulty. If there are differences in understanding the basic goals, that is more serious. Conflicts in norms are cultural, because norms are the way you do business. When you have differences and conflicts in culture, you can really be booby-trapped. If you have an underlying basic difference in values, then that can really be landmined. If you think in these terms, you really need to be synchronized from the top management down and pass on the values, the culture, the goals, the strategies, and the data that you're using to understand your system.

### Fad or Fact?

Is this just another management fad like management by objectives, and strategic planning? Is total quality management a fad, or fact? Here are some examples that indicate that TQM is real, and is here to stay.

At Ford, "Quality Is Job One." Donald Peterson, a Deming disciple, said, "Those enterprises that don't adopt a quality culture simply are not going to succeed." A lot of senior executives in the United States today believe this statement and are talking about it. Big companies are increasingly demanding that suppliers organize and follow the principles of TQM. One major money center is actually looking at a commitment to total quality as a determining factor in evaluating a company's risk. It is coming into the whole business infrastructure in the United States.

The Malcolm Baldrige Award for National Quality has become important to a lot of companies. This is a significant award and companies are competing for it. The award is oriented toward the Deming philosophy. The process refocuses the company and makes it look hard at itself. It gives companies a level of understanding of good and bad. To apply for this award, you have to rethink the company philosophy. The criteria for the Malcolm Baldrige Award are based on the Deming total quality principles. First, you need to have a plan to keep improving all operations continuously, then you need a system for measuring these improvements accurately, a strategic plan based on benchmarks that compare the company's performances with the world's best, a close partnership with suppliers and customers that feeds improvements back into the operation, a deep understanding of the customers so their wants can be translated into products, a long-lasting relationship with customers, a focus on preventing mistakes rather than just correcting them, and a commitment to improving quality that runs from the top of the organization to the bottom. These are the criteria that you have to write in order to apply for the Baldrige Award.

In November 1989, the First National Total Quality Management Symposium was held, co-sponsored by the AIAA. 850 people attended, double the expectation. The highest levels of government and industry - the CEOs, the Assistant Secretaries - were represented and all were expressing their strong convictions that TQM is here to stay. Skeptics must discard doubts and embrace the concept or be left behind.

Aerospace customers and suppliers, the STI Program's users, or at least a large portion of the user community, are reading about TQM in every *Aviation Week and Space Technology* magazine.

But what can you say against TQM? Changing to the TQM culture is a frustrating experience and expensive; it's not a free ride. It's a complete shift away from short-term perspectives. The CEO and bottom-line-oriented financial officers have to switch to a long-term view, which requires extremely strong outside motivation. Our culture is very short-term, bottom-line oriented. This thinking mitigates against this being a process of a system that really will have long-term impact as opposed to just a passing management emphasis. Change is inherently disruptive and will test the skills and intuition of even the most committed. Senior managers have to accept the timeframe and commitment required. Suppose, for example, that Gladys has been reading about TQM and she says you've got to have a long-term perspective - you've got to commit to my budget for five years so I can get this job done. This is what TQM says and this is what industry says you have to do; but how do you get from here to there? And smart competitors aren't sitting still.

### Conclusion

In closing, here's an interesting statistic. Quality or price? What cost are people willing to pay? This was from *Time* magazine, 1989. A leading quality consulting firm in Massachusetts did a survey and concluded that while price still plays an important role in buying decisions, more customers demand high quality at any price level. Quality is more important than price. In 1978, 30 percent of the people said quality is more important than price. In 1988, 10 years later, 80 percent of the people said quality is more important than price. People are beginning to recognize the inherent cost of lower quality.

### Discussion Summary

Some potential problems with TQM are that it can take up to 18 months for a company to do a feasibility study for adopting TQM; employees spend an inordinate amount of time in Quality Circle meetings; TQM is such a new way of thinking for most U.S. companies that adopting it is like adopting a foreign culture; with changes of ownership and frequent turnover of upper management, adopting TQM is difficult.

Two companies that have adopted TQM successfully are Florida Power and Light and Xerox. Florida Power and Light employees seem to be happy, judging by their low

turnover rate. Xerox is so proud of its conversion to TQM that it prefaces all its client presentations with 20 minutes on TQM at Xerox. Xerox has also won the Baldrige award. Barbara Lawrence thought that applying for the Baldrige award was a mixed blessing. AIAA received excellent feedback in a debriefing session, but to continue to apply requires compiling statistical data on many levels for several years, which requires a lot of staff time. Apparently Admiral Truly wants to apply for the award for NASA in 1991 or 1992.

Adopting TQM does improve QA, because QA is part of the TQM process. Deming was a statistician; therefore measurement is an important component of the TQM process. Each team member participates fully, even in a service industry like the STI Program. Think of service as a product.

Government-contractor relationships can incorporate TQM. Some are beginning to adopt the principles already, communicating wisely.

*What CASI Has Done To Improve Quality*  
Joseph Gignac and Dian Marincola

What has CASI done to improve quality? To select one example among many products and services, let's concentrate here on database quality. Database quality is measured in terms of accuracy, completeness, timeliness, retrievability, and perception. These terms are not new. Whenever you think about database quality the first four come immediately to mind.

Accuracy in the data is a very complex concept to deal with. It includes format, spelling, indexing - are we consistently applying the appropriate index terms, do the appropriate indexing terms exist?

Next is completeness. If we're supposed to have the premier database on aerospace engineering, do we have all the NACA reports? Do we have all the related literature? Are all of our records in scope? Were they in scope one time and are they now out of scope? Do you have everything you need to have? Can you plan to get even more - which also ties in very nicely with timeliness.

Do you have the information in your database when you need to have it? And if you have long queues, is the information going to get out fast enough to be relevant to the R&D process?

As for retrievability, you put records in the database so you can get them out again. An error in a record will not necessarily affect retrievability. If you have a record with an item spelled wrong and that happens to be the word "the" you don't really care because you are not going to retrieve on it. That misspelling matters for something else but it won't necessarily impact retrievability. Even more important than the obvious things like

correct spelling so that it can be retrieved properly, are you using proper formatting? Did you use proper conventions in indexing, etc.? What's even more important is do you have enough fields so that you can retrieve the record properly? You're looking at the scope of the whole database for quality issues.

It all comes back to perception. It doesn't matter if all of these things are great, it's a great and accurate database, that we have run all kinds of spell-check and formatting routines before we put it into the system, it doesn't matter if it's complete, that we hand-checked everyone of them, and we know that they're all in there and timely. We have indexed everything, we've got full text - none of this matters if the user's perception of it is that it is garbage. And that is the hardest thing to remember when we're dealing with quality - the perception, from the user perspective.

#### Database Quality Improvement at CASI

Over the years CASI has done a lot to improve the quality of the database. Perhaps the most significant development effort that the Input Processing Section at CASI has undertaken is the machine-aided indexing (MAI) capability. MAI was established over about a 10-year period. It was probably in the neighborhood of a ten to fifteen person-year level of effort and at the moment it's a real time-interactive tool. It doesn't replace the indexing capability of CASI; it's an assistant to the indexers to allow them to enhance the thesaurus term selections. In other words, the lexical dictionary, which was built over a number of years, is used as the base by which input from other agencies, such as DOE and DTIC, and actually the keyed abstracts, during the STAR input cycle, are done on an almost real-time basis. We've taken that capability and applied the NASA machine-aided indexing to all of the file series, such as the STAR series, the Limited STAR series, the unannounced, RTOPs, and so on. This has increased the term selection for retrieval purposes which Dian mentioned from an average of 8 to 10 terms per document to 10 to 12. This ties in with Deming's philosophy of constant improvement. And it's an improvement that could even be applied to AIAA. That's just one of the most significant efforts. This system not only increases the term selection and focuses those selections on what is really relevant to NASA's interest, but it is also used as a quality aid for input: our quality control staff checks titles and abstracts against terms in the lexical dictionary.

I don't know of any test of MAI against AIAA records. Again, this is an aid rather than a replacement. The next capability that we've undertaken more recently is the machine-aided duplicate check process. Heretofore, this has been a manual operation. After the cataloging is input, this is a machine validation check against the database and authors' other reports that might be in the system, to minimize the duplicate processing activity which is very costly. And it eliminates the errors associated with the repetitive manual process.

We have staff at CASI who are part of the CENDI cataloging standards committee who are working with the other Federal agencies to assure that the current cataloging

standards for standardized contract number format are viable and uniform across the agencies. More recently, machine-aided corporate source code selection capability was developed. This is an automated routine that looks up DTIC and DOE corporate sources and translates exact text matches to NASA corporate sources and codes in search code and tracks it to the IPS record. This is, again, not a replacement for a cataloging task but an aid.

Another significant activity at CASI is continual updates to the database records. We are always receiving new or corrected information - the spelling of an author's name, a corrected report number — and we change the STIMS records.

In the post-STAR review, several key folks sit around and look at STAR and check to see whether the indexes are good and the abstracts are descriptive of the source document. These are all ongoing activities that strengthen and improve and enhance the quality of our products.

Retrospective indexing is another interesting capability we have at CASI. As good terms are identified, old records in the database need to be changed. We also use the thesaurus. These new terms apply to the old file series. It's not a static operation; we are constantly looking at new and better ways of improving the quality of the input.

This applies not only to CASI - we have 25 years of experience with ESA European technical reports using the NASA standard formats. We've used those standards across the other government agencies such as CISTI, NASDA, ISA, and ADIS recently. We provide them the training, provide them the evaluation of their input, and provide them the feedback. Again, this is all part of the effort to ensure that what comes into the database is going to be standard and of high quality.

Along those lines, we have developed a very comprehensive input processing manual that is a hands on "a to z" - how to prepare a record, what to do with it, where to send it, how to put it on microfiche, what goes on the masthead. This is for NATLEV. We did a lot of work in maintaining and updating the corporate source authority and the acronym dictionary.

These are just a few of the things that are going on at CASI under the direction of NTT. We're constantly looking at better ways of improving the quality of input. I'm not saying it's all comprehensive, certainly there are areas for improvement and that's what we'll be continuing to look at.

*Quality from the User Standpoint (Abstract)*  
George Roncaglia

Paper products show improvements in turnaround times. Billing methods and procedures may also be improving, but data are insufficient at this writing. Reproduction quality still

needs improvement, using past year's receivals as representative output.

RECON is not keeping pace with the large-scale increases in SciTech publications. The amount of information going into RECON has declined while publishing levels have greatly increased. Net disparity between the two is wider than ever. Greater ease of use is important, but increased user-friendliness will be largely irrelevant without a more inclusive database.

LaRC users would like to see RECON improvement, document conversion to electronic formats, and more creativity used in charge-back mechanisms.

*Database Quality: User Views Test Producer Perceptions*  
Barbara Lawrence

TQM is about continuous improvement, and that's the issue we face in addressing the NASA STI database. In considering the NASA database - lower-case database, meaning the generic database - regardless of whether it's used in print in STAR or IAA, on RECON, or ESA, or DIALOG - on whatever output format, we have to think about the core of the data and the database. Quality has always been a hallmark of the NASA STI database, but user expectations change. That's why we have to continually reassess what we mean by quality in this database. Let's review our understanding of current user expectations for a quality database, and test the STI database against these perceptions and expectations.

Database Records

Primarily, I'm looking at the context of the records in the database. We all tend to view this NASA STI database from the output mechanisms that we are involved in. We have to step back from thinking about use and go back to the core, or the center, of the database. We're talking about this today because quality has developed a lot of visibility. It's a hot issue in the user community. We don't think of quality so much in the context of a government database but a lot of these issues were raised by people saying, what if the databases are inaccurate? — we've got the author's name wrong, we've put the wrong data in there somewhere. This is a litigious society; is somebody going to sue us? Or perhaps the database is not complete, not what we thought it was. You said it had all of these things in it and I didn't find them. What's going to happen? So the database-producing community realized it had better address these issues.

Users use more than one database - not just all the files that are accessible through NASA/RECON, but all kinds of information - and they see a lot of examples, good and bad, a great variety, and they get new ideas and new expectations from all of that. Particularly in the NASA system, ours is a cooperatively built database in that the data come from many parties, and that number is likely to increase in the future. Now is a good time to think about what the current guidelines and standards for building this



database are so that when data come from Canada, from New York, from Baltimore, from Australia, they are all consistent with each other.

I don't know what the rules are for suing a government agency and maybe it wouldn't apply directly here, but someone could sue a database producer or a database host if the data were inaccurate. This could happen if you put in an abstract "1" instead of ".1" and somebody built research based on that information.

Obviously, quality is an attitude; not necessarily a matter of money but a matter of smarts. We need to work cooperatively, to talk to each other. I'm a strong believer in what I call "working out loud." We need not only to have standards but to continue to review them to see that they meet current expectations. By standards I mean the internal processes as well as the formal external standards from ANSI and so on. We need to think about complexity versus simplicity. Sometimes we tend to make some things more complex than they need to be and maybe if we stepped back a little and ask ourselves whether we can do things more simply, we can improve our quality processes.

#### User Interface

We also need to recognize that the user sees database quality only in the context of the whole system. When I was at Exxon, we did everything we could to capture every document, every piece of technical correspondence, in or out of EXXON worldwide, but our user mechanism in those days was computer output, microfiche indexes, and full-text microfiche of the documents. Often at a given smaller location the manager wouldn't spend the money to buy a microfiche reader and printer, he'd only buy a \$150 reader. So here you have probably spent half a million dollars creating a database that had everything and people hated it because it was unfriendly to use. And then to read everything and not have a printer to compare the text from the document can be very difficult - so all that effort was almost for naught because as far as the user is concerned the whole system was just that microfiche. Ultimately, the searchable part of the database went online. We never did centrally divide the microfiche reader and printers for remote sites but we did a lot more work higher up in the management. We'd go to the management of that site, or of that division, and try to talk about why they needed to have more efficient user equipment. We may have the same problem with CD-ROM.

What they're doing now is capturing much more of the full-text data. The fiche readers from the early '70s processed into full-text databases as well, but even in those days with these microfiche readers you loaded the fiche indexes into a cartridge so you could push-button your way through the searching of those indexes. It seems funny when you think of it that way, it seems kind of primitive, but it was a very large database for its time.

I finally got to where I decided I'd better have one of these on my desk. If the way we're disseminating information throughout Exxon around the world is on microfiche, I'd better get comfortable reading it, because if I can't do it, then how can I possibly ask someone else to do it.

### User Feedback

The information for this presentation comes from our own contact with customers, partly through our customer service hotline, our 800 number, and particularly through the exhibits that involve both the information industry and AIAA technical meetings. We talked to scientists and engineers as well as information specialists. We also talked to people who are members of the AIAA Technical Information Technical Committee who are leaders in the corporate aerospace information environment. And generically, we've participated in the National Federation of Abstracting and Information Services (NFAIS). Groups that are working in the area of quality have a working group which I'll talk about a little later to define database quality issues. We've been involved with the Southern California Online User's Group (SCOUG), and a workshop they held last summer where they defined database quality characteristics. I also looked at the literature and I have a bibliography, not comprehensive, but just some things that I have found interesting on database quality.

### Quality Needs

Next let's look at quality needs of users and where these needs come from. The intermediaries are the most specific about what they want. The interesting part of that is not only do they want it all but they seem to keep redefining the "all." That's the challenge for us in this room: how do we keep up with that "all" and how do we judge what's reasonable and what's not reasonable, and what's cost effective and within our means and abilities? Another message that users have sent is that they want the database producers to cooperate with each other as well as wanting the database producer and host systems to cooperate. NASA is unique in having the ability to call the producers together: the AIAA, RMS, whoever it is, you can pull them together and talk about what database quality is and get them to work together. And at least in one of the using venues you're also a manager of the host system so you have a way of making sure that those processes talk to each other. End users are much less concerned with the specific sort of things intermediaries mention. They don't want jargon but they do want consistency. They want to know what they're getting. They need systems that will help them with search strategy and database-seeking guidance but they don't want to know how they get there, they don't want to learn about database file structures, they don't want to know about statements of coverage and scope, they just want to know, "Is this the database that I need to get where I want to go?" The specific group of users that we all worry about, aerospace scientists and engineers, understand and are pretty sophisticated as a user community. They understand the concepts of databases and information retrieval. They're not intimidated by technology, their needs are for very specific problem-solving information. That seems to be confirmed over and over again with conversations that we have with our findings, from Tom Pinelli's data, and so on. And they need that information on their timetable. They don't want to wait for an intermediary in the library to have time to do a search for them - they's rather do without the information than wait a week for it. Aerospace scientists and engineers will do the searching themselves and they will learn a complex system although they would rather not. But if they're not pleased with the service quality, with the database and the

system that database sits in, they'll find another way to do it. For example, Paul Zarchan is a scientist, an AIAA member at Draper Labs, and they were doing an experiment of end user searching and they wanted him to do all the searching in the library and he said I won't, no way. Then I'm meeting your timetable, your requirements, even if you're paying for all the searching and all the databases and everything else. He said, "You give me one lesson and give me a password. I've got my portable PC and I'm going to take it wherever I go and see what it's like to use information all the time." He went away and that's what he did. It was on his terms for his needs. He needed not only scientific and technical information but newspaper information and business information. He was on a meeting program session we had in Reno with Roger Summit, he wanted to know who was Roger Summit anyway. So he went and looked him up on a Who's Who database and found out who he was talking with on the program.

### Problem Solving

Problem solving addresses issues of indexing, particularly, and I have a lot to say about indexing. How do you get to the right level of specificity in a database as comprehensive and as broad as the NASA STI database? The quality of the abstract is another thing. There I think we stand up very well. The abstracts are truly informative abstracts in this database from all sources and that turns out to be very helpful. Some of it can be in the software end but that's one of the issues that we face. If we only deal with the problem at the retrieval software end, then that's only going to help the people on that database system, and this database is used in a variety of systems. If you do an improvement at the RECON end, that's terrific for all the RECON users, but it does not penetrate the data which are then used in a number of ways. Some of the folks who have been talking about database quality are Tom Aitchison, who initiated the whole rebuilding process for the INSPEC database. This has been one of the most impressive efforts in our community for a long time. It was a 3-year process. They rethought everything. Did they need all the fields, did they need new fields, did they have to retrospectively index old documents? They treated all the records from beginning to end. Jo Maxon-Dadd has tremendous experience both as a database user and from her Lawrence Livermore days as a database teacher at DOE. Now with 5 or 6 years at DIALOG, being responsible for the Sci-Tech databases, and having worked with databases of every size and shape and quality, she has a lot to say. Ann Mintz is in the business community but is one of the most thoughtful database users and articulate in terms of describing database quality criteria. In a workshop last summer we spent three days trying to define database quality characteristics. SCOUG has picked up on that work and is working on four codes of practice for database producers. One is standard database description, the second is a code describing interaction between database producers and vendors, the third is a code of practice for customer interaction with the producer or vendor, and the fourth is database quality per se. They're trying to define measurable or definable characteristics of databases, and how to implement a rating system.

NFAIS decided they didn't want to get involved in a rating process. Publishing all these ratings has gotten highly complicated. Each database on each host system needs a

different rating. It seemed too complicated so we just created a set of guidelines. And there are so many variabilities. What's timely for an STI database is completely different from what's timely for a stock-market database.

### Retrieval Environment

The information retrieval environment has changed a lot. The tools have changed, our experience base has changed. In 1972, all we expected was to have a database. That meant quality. Later on quality was defined as improving the searchability of those databases by adding abstracts, because not all the files originally had abstracts loaded. Then it was making all the fields searchable. Then, looking at some things like the Union List and the Battelle online system which was commercial for about six months. They loaded NTIS without the abstracts. Dialog had it with the abstracts. They loaded one database with a stopword list that was any word fewer than four letters so we in Exxon could not search for oil, gas, tar. They didn't stay in business long. Then database users worried about errors, particularly basic typographical errors and wrong codes and so on and Compendex was the database we loved to hate. We used it because it was necessary but nonetheless everybody loved to complain about it.

### Indexing

Then we thought more about index quality. The people here might be more familiar with the National Library of Medicine and the whole structure of the MeSH system. I was obviously a user of the American Petroleum Institute database and that had a very, very controlled structure. API's is not really a controlled vocabulary. It's better than a term list but it's not fully controlled. One feature they had was called autoposting. How can you get to the right level of problem solving? People indexed, as we all do, at the most specific level of the item. But all the terms above that in the hierarchy were automatically coded into the database so the searcher could go in at any level. If you wanted animal you'd get cat and dog and animal and rat and rabbit. If you wanted rabbits, you'd only get rabbits. And if you wanted long-eared rabbits, then you could go and search for long-eared rabbits. The searcher had good retrievability and reliability in their system. Other approaches to indexing show how complex getting it right is; for example, the ABI Inform business database. When it started it was interesting to a lot of people because there weren't any other business general-magazine kinds of databases out there. However, it didn't have any indexing, it was just free text, the words and titles and abstracts. Business language has a very uncontrolled vocabulary, unlike scientific language. People demanded indexing so they created a machine-aided indexing process, and indexed the whole file. It was garbage. They had to throw all of that away a couple of years ago and then go back and manually index everything. It had to do with the structure of the kind of information, the kind of language in that literature, and manually was the only way they could do it. Now it's one of the most highly regarded and highly used databases in this country, being loaded on the systems and at all kinds of universities because it does serve a purpose - but it wasn't a quality database when it started.

### Information Use

To evaluate the effectiveness of information retrieval, consider the integration of the results into the user's own life as well as the evaluation of the usefulness of the information for the resolution of the problem. This addresses not only relevance in recall in a search - not just whether we found information that the users wanted to solve the problem - but did they in fact use it. We've now raised the measure of quality one step higher. Can they use it, did they integrate it into their lives?

### Defining the Question

Our systems are geared to answering well-defined questions. In the last few years we have improved the retrieval system so that the databases are easier to use, and we can help people through that process better. However we're not as good at the earlier phase of the information-seeking process, the definition phase. Most people don't start off with a very specific question. Sometimes they do, particularly in engineering. You want to find the standard or the specification for x, you want to know if there's a widget for y, you want to know if somebody has designed an algorithm to calculate the flow in a certain place, whatever it is, you have a specific question - but often you don't. You're just faced with something and don't know where to start and our information systems don't really help people very well with that.

### Characteristics of Quality

The generic characteristics of quality on my list are accuracy, comprehensiveness, consistency, timeliness, accessibility, support, cost/value, and TQM. The first four characteristics are the ones that deal with database quality per se and my definitions are no different from the previous ones. Accuracy means error rate, error correction, treatment of errata. Comprehensive applies to scope and coverage, gaps, source evaluations, source quality, duplication. Consistency. Do we use guides and standards? Are we consistent over time? Do we do what we say we're going to do? If you say you have 100% abstracts, do you have 100% abstracts? The next three qualities relate to the system as a whole. Accessibility, support, and cost and value. TQM is on the list because we won't have any of the others unless we manage intelligently; we need quality assurance and quality control processes. Are our staff trained to understand what we want out of the system? Are they empowered? Do we embrace the philosophy of continuous improvement? Do we evaluate what we're doing on a regular basis? Do we see what others are doing and learn from them?

First, let's look at the EUSIDIC guideline on correcting and updating (or the draft), then we'll take these characteristics and look at the NASA STI Database, and I'll give a very personal assessment of how I think the database may stand up.

In the area of accuracy the European Association of Information and Dissemination Centers (EUSIDIC) has issued a draft guideline on correcting and updating. A lot of these guidelines have to do with the interaction between the user and the database producer. Guideline One: Organization and Supplying Data, should indicate to the

customer the organization's policy regarding data changes, modifications, or corrections. Guideline Two: Any organization making changes to existing data should always inform all organizations delivering the data to third parties. Guideline Three: The normal method of correcting data should be by adding an addendum to the existing data rather than replacing the record. In all the commercial databases and in the government systems, we replace an old record with a new record. It would be a radical change around the world if we followed Guideline Three. Guideline Four says that all collections of data should make explicitly clear the date of the last update and the most recent information that is in that file; if it says the file was updated on June 15th and the newest record is May 29th, people won't go looking for stuff they can't find. Guideline Five: Where practical and possible, all collections should make explicitly clear the latest time and date for which data can be found. This draft doesn't address all the issues, just a few specific things. This draft is now circulating for comments and by the end of the year will be issued in some form or another.

I think this NASA database stands up very well in terms of these quality characteristics, but the user expectations have changed over time. As more of the international parties get involved it's a good time to think about what we've learned and see if we need to review, modify, and upgrade our guidelines and do some work on the older data in the database. In terms of accuracy, for instance, we all correct errors as they're found in the form that shows up in RECON. We basically go back and correct the STIMS record so RECON users get revised data, whether it's a typo in a title, an incorrect code, or whatever might be found. But if those corrections are made after the date of publication of the IAA STAR issue, the users of the print version only do not even see those corrections.

Our record checking is almost all automated. The quality assurance processes and the validation processes are all automated, both at AIAA and at CASI. But there are errors. Particularly, in the olden days, errors occurred in the abstract. They occurred in transmission, or in transformations from system to system, particularly with some of the kinds of hardware that were used once upon a time. The LNS file goes back to the early 1960s, and there's material in there that's messy.

In the area of comprehensiveness, in terms of scope and coverage, the database does stand up very well. One thing that is very special about this file is that there is no gray literature: it has all the document types, it has the technical report literature, it has the meeting paper literature as well as the journals and the books and all the pieces. That's a strength and a breadth that very few databases have. We do review sources for quality. Does this journal, for example, cover the same kinds of things that we now are looking for? We all have faced resource limitations and have some different acquisition approaches. That's been a big issue with Europe. What they think they need and what we define as scope and coverage weren't the same things so now we're trying to rectify those issues. Some parts of the input community to this database are more aggressive in acquisitions than others. Some of the European users didn't put in all the documents

that they might have because they only had to put in one for every hour of use. That kind of approach and philosophy sets a policy issue that will change the completeness of European acquisitions. However, the general sense is that the basic approach towards comprehensiveness in this file is very good.

In talking about consistency, let's look at the thesaurus as an example. It's a very good thesaurus. It has good inclusion of terms. There's a lot of information that's in the printed tool, the access vocabulary, that has the data, the term, and the definition that isn't in any of the online systems and that would be valuable to users. We have to think about whether we update the terminology often enough or not; particularly, the retrospective indexing which you said you're now doing at CASI. But are the other people who use the same records getting that new data so that all the users of the data are seeing that improvement?

Duplicate checking is an important consistency and accuracy process. The structure of the thesaurus allows for good searching. This thesaurus does a very good job of covering not just the scientific and technical terms but the mission terms, the systems terms, the properties and characteristics, and the different sorts of scientific aspects of this literature. The fact of having major and minor terms makes for good searchability. The level of indexing to give you a good balance in terms of recall and relevancy. There aren't too many terms. If you have a database that indexes everything that you might think of, then you get a lot of garbage when you do a search. If you don't have enough terms, you don't find the things you need. But I suspect those guidelines, and the application of how we approach indexing, are quite different among the providers. We need to evaluate the machine indexing against the STAR records versus the IAA, not just in terms of machine indexing, but to find the differences.

Considering the use of codes, I'm sure that we all do the right coding but our coding systems may no longer be the right systems. Names of countries change. We have had a big debate about whether you change the codes or not, and for the moment we've decided to look at this from the point of view of retrievability. What if you changed all the codes that said Germany, the ones that used to say East Germany and West Germany in the country of origin field? You can change the country code to Germany, but the author affiliations will still say East Germany or West Germany or wherever the author was at the time the article was written. You'd preserve the integrity of the information but you'd also preserve the retrievability.

In the records in the database some fields exist only to create various print products that may or may not still exist. These fields are no longer necessary. The file structure of this database is based on some combination of print-driven philosophy and the computer technology of the early '60s. There is a lot of funny stuff in there. I looked at three other questionable data elements, not just the country code. We should reconsider some fields. In the author and author affiliation fields, our policies are to put the NASA authors first and to group the author affiliations, so that if the first author and the third author are

from the same organization, we move the third author to second. Well, this isn't how the users want it. The scientists and engineers want the online document to look like the print document, and our method is very confusing to people. And, if you talk about doing a duplicate check between this file's post-processing mechanisms and others out there that create the print version, we have certainly created a problem for users in that respect. There are some other differences in author fields in the way of punctuation, but the sequencing is one of the bigger issues that we're going to look at. We've discussed subject categories. The country codes: do we update, do we not, what do we do with those old records, at what point do we all agree, all the people who are entering data in, to start using a new code? Do we wait until there's a national coding system, do we read the newspaper and get on the phone and call Jim Erwin and say how do we make a decision about this? How are we going to deal with those things? The database structure was originally designed so that the smallest data element intellectually was also a data field. Now we tend to combine them, and when we try to create algorithms to parse them out for better retrievability, it's very hard to do. We can't always do it. It would be good to separate them again for publishing purposes - in our system we create the journal volume, issue, and all that stuff separately - but when we get the data back from STIMS it's all together again. That's another issue to consider. What's the right way to do it for all of us?

#### New Fields

Some fields that users tell us they'd like us to think about are ISBN, CODEN, treatment codes, specialized indexing, pre-1972 abstracts, and trade names. We do have ISSNs for serials but we'd like to go back and add the old ones. We'd like to add the ISBNs for books. Treatment codes is a current topic that other sci-tech databases want. They tell the user whether an article is about theory, has experimental data, is about design, is a review article, or is a policy article. It's another way to cut the database so that you get a better kind of answer, better precision. There's specific indexing for specialized purposes, the kind of project that's starting today, such as the National Space Science Data Center (NSSDC) indexing, where six journals are going to be selectively processed with a coding system that meets the needs of that community. Is the database designed to accommodate that kind of specialized process? Users also ask to have the older abstracts loaded. It seems as though it could be managed with the scanning process, but I know that database producers who have experimented with that have gone another way and are using offshore keying to get at the old data. Some users also want trade names. The NASA policy for the thesaurus is not to add commercial trade names, yet users would like to have access to them. Should they be included as index terms or in the thesaurus? That's another policy question.

#### Fields to Delete?

There are some fields to reconsider. First, corporate source codes. Since the systems can now search by name and since the corporate source codes, as they've been used over the years, have changed, the same code gets reused for different organizations and they don't pyramid. Imagine a system where code 123 is Boeing and code 1234 is Boeing



Military Aircraft and 12345 is Boeing Military Aircraft in a specific location, so you can search at various levels of specificity. Why do you need to do that when you can now full-text search on the corporate source field? That would save a whole lot of us a lot of headaches in trying to keep these codes up to date. When the data we create are fed to CASI, we see from their validation processes that most of the errors come from corporate source codes that have just been issued in the last few weeks. Then there are sales prices. By the time you publish them, vendors probably have changed them. Again, this is from a print publication, when people primarily read this abstract bulletin and looked at it for new books, and that's not how the information is used any longer. A lot of codes are internal to NASA to produce specialized print bulletins. But we don't need all these codes anymore. Another example is the number of analytic subsidiaries. If you've got a conference entry, does anybody use this information?

### Evaluating Data

We should sit down as a team and evaluate whether we need all the data we have, and whether we are not collecting data that we should be collecting. I think we have a good database, but in keeping with the philosophy of continuous improvement, there are questions to be asked. Maybe we'll make changes, maybe we won't. But this is a good opportunity to raise the questions, particularly as we have multiple organizations responsible for creating data that go into the file - and their number is clearly going to increase as time goes on. The objective of the quality database is to provide the right information and information that is easy to use at the same time. If it's the right information but hard to use, it doesn't make any difference because nobody is going to use it. We all know how to do it if we look at the definitions and guidelines. We have the tools to create clean data, to update our input guidelines, and to ensure consistency. We have quality assurance and quality control processes and we can share them with each other. I think we do a very good job of that. The issue for us is a matter of cooperation and intelligence. It's not a matter of money, it's not a matter of things that are impossible or difficult or driven by the technology. It's a matter of sitting down and addressing the questions together.

### A Selected Bibliography - Database Quality

Aitchison, T.M. (1988). Aspects of Quality. Miles Conrad Memorial Lecture, *NFAIS Newsletter* 30(2) (April).

Basch, Reva (1990). Measuring the Quality of the Data: Report on the Fourth Annual SCOUG Retreat. *Database Searcher* (October 1990): 18-23.

Kuhlthau, Carol C. (1991). Inside the Search Process: Information Seeking from the User's Perspective. *JASIS* 42(5): 361-371.

Lawrence, Barbara (1990). Database Publishers' Challenges for the Future. *Information Services and Use* 10(1990): 293-304.

Maxon-Dadd, Josephine (1990). Refurbishing an Elegant Victorian Database — A View from DIALOG. In W. Shipper and Betty Unruh, eds., *Trends in Database Design and Customer Services*. NFAIS, Philadelphia.

Mintz, Anne P. (1990). Quality Control and the Zen of Database Production. *Online* (Nov).

Potzcher, Gunter and A.J.C. Wilson (1990). User Needs in Chemical Information. *J. Chem. Information Computer Science* (30): 169-173.

### Discussion Summary

Initial action to take to assure database quality will be to form a working group consisting of representatives from NASA CASI/RMS Associates, AIAA, NASA Headquarters STI Program, and RECON users (information intermediary or scientist). This group will meet and draft a strawman document to be circulated to the rest of the STI Program community for comment. Barbara Lawrence feels that this initial step could be completed in two 2-day sessions. Jean Tolzman stated that it was important to define terms before doing anything else, and draft a statement of intent of the database: What is this database whose quality we want to improve, and what is it for? Who are its users and what do they use it for? To what extent is its structure defined by print technology, and should it be?

Barbara Lawrence said that initially the working group should concentrate on the structure of the database, and particularly the structure of individual records. Dian Marincola suggested they concentrate on the "Aerospace Database"— STAR and IAA — because their record structures are similar to each other and to those of several related files. Geoff Worton felt that they should address scope and coverage first.

The document created by the working group should identify incremental tasks to be accomplished to attain a quality database, and should then rank these tasks in priority order.

Some specific tasks mentioned were

- looking at fields in records and assessing which ones to retain, to delete, to revise or to condense;

- consulting with INSPEC about the recent overhaul of their database;

- thinking about initial actions that could be taken such as emulating Penn State's "Oops" command that allows users to comment on individual citations online;

- keeping all organizations that supply data in mind when considering changes to format;

- looking at how records are selected for input into the database;

- looking at the relationship between the database and the print media it generates (*STAR*, *IAA*);

- looking at how the data are used—what do the users do with the information they find?

- considering whether to change Country of Origin entries to reflect historical change; e.g., East Germany and West Germany could be changed to Germany;

- considering mapping new subject codes to former ones;

- remembering that what is wanted is a *process* for assuring continuous improvement of the database, not just one-time changes.



---

## HOW MUCH QUALITY CAN YOU PAY FOR?

---

NASA STI Coordinating Committee  
"QUALITY"

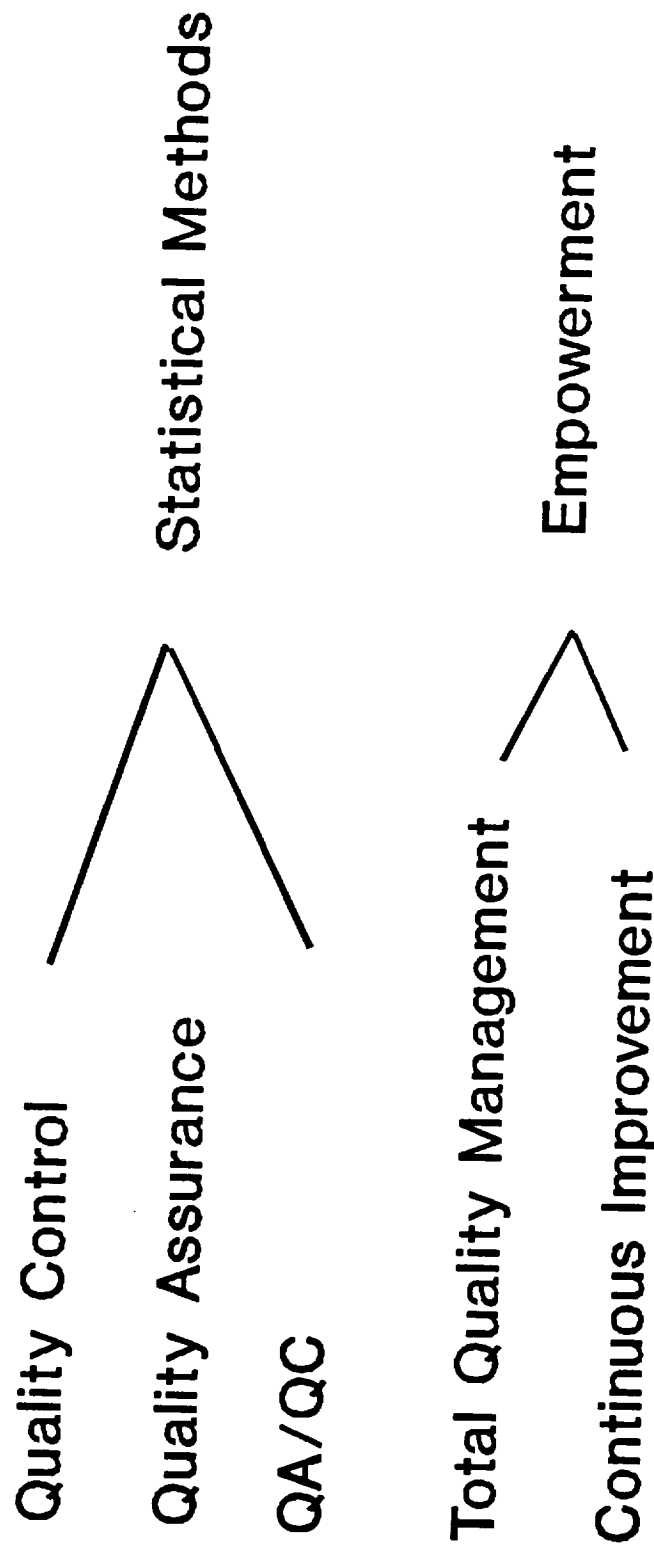
July 1, 1991

Bonnie C. Carroll  
Information International  
Oak Ridge, TN

## DEFINITIONS OF QUALITY

1. Relative excellence
2. Value for money
3. Conformance to drawings and specifications
4. Conformance to the purchase order
5. Fitness for intended function

# EVOLUTION OF QUALITY THINKING



## QUALITY ASPECTS OF DATABASES

- Typographical quality
- Content quality of record
- Scope and coverage
- Timeliness
- Accessibility



---

## WHAT'S THE ISSUE

---

Internationally - We're getting beat

Institutionally - We're not being used

Individually - We're not happy

## DEMING QUALITY STORY

- 1940's Taught statistical techniques to American government and industry
- 1950's Initiated a new order in Japan - How to Manufacture Quality
- 1980 NBC 90 Minutes "If Japan Can, Why Can't We?"
- 1981 Don Peterson at Ford called Deming

"The Rest is History"

## DEMING'S MAIN POINTS -1

- "Quality can cost less because you design it in rather than inspect it in."
- "Improve constantly"
- "Create constancy of purpose"
- Means staying ahead of the customer, not only meeting present needs, but planning for future needs, as well.

## DEMING'S MAIN POINTS -2

- Creates a new economic age with single global market
- Mass inspection doesn't produce quality
- Buying from the lowest bidder is costly
- To get supplies, work with single supplier to improve Q and lower his costs, developing long term relationships in which both profit
- Statistical methods are a means to understanding

## 3 RULES OF TQM

1. Focus organization's energy on one single thing: TOTAL CUSTOMER SATISFACTION

- Everyone on production line

What does this thing I'm doing have to do with achieving customer satisfaction?

If nothing find a way not to do it.

2. Organize all work as a process

- Focus on improving processes not on good results.

3. Give people a chance

- Seek continuous improvement for themselves and the organization

## **SERVICE QUALITY HAS SPECIAL CONSIDERATIONS**

- More difficult for customers to evaluate than goods quality so more difficult to comprehend.
- Customers don't evaluate only on service outcome - also process of service delivery.
- Only criteria that count are the ones defined by customers

---

**SERVICE QUALITY IS DEFINED AS THE  
EXTENT OF DISCREPANCY BETWEEN  
CUSTOMER EXPECTATIONS OR DESIRES  
AND THEIR PREPERCEPTION**

---

**SERVICE EXPECTATIONS ARE FORMED BY:**

- Word of mouth communications
- Personal needs
- Past expectations
- External communications

Zeithaml

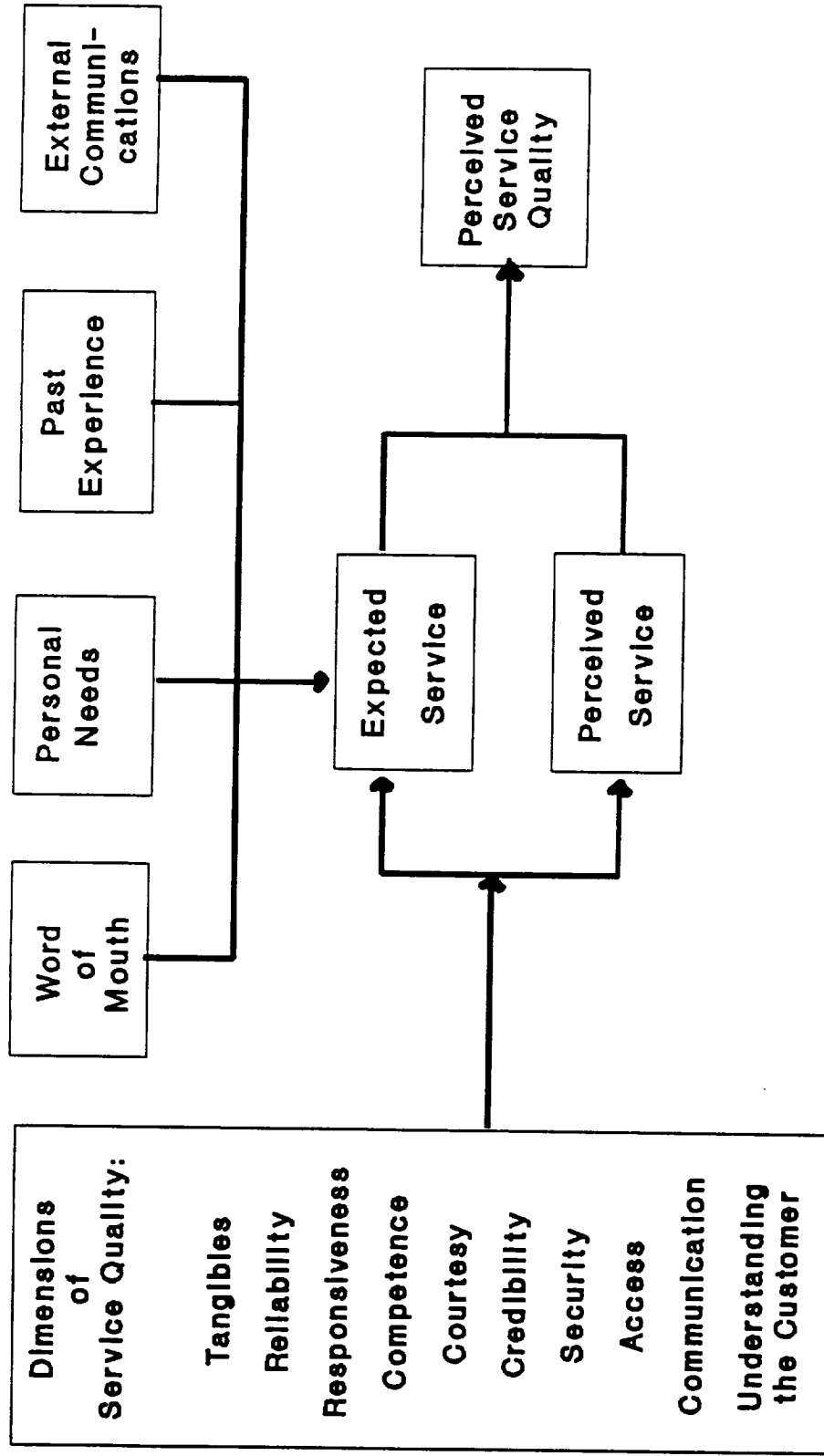
## **DIMENSIONS OR CRITERIA FOR DEFINING QUALITY**

### **Dimension and Definition**

<b>Tangibles:</b>	Appearance of physical facilities, equipment, personnel, and communication materials
<b>Reliability:</b>	Ability to perform the promised service dependably and accurately
<b>Responsiveness:</b>	Willingness to help customers and provide prompt service
<b>Competence:</b>	Possession of the required skills and knowledge to perform the service
<b>Courtesy:</b>	Politeness, respect, consideration, and friendliness of contact personnel
<b>Credibility:</b>	Trustworthiness, believability, honesty of the service provider
<b>Security:</b>	Freedom from danger, risk, or doubt
<b>Access:</b>	Approachability and ease of contact
<b>Communications:</b>	Keeping customers informed in language they can understand and listening to them
<b>Understanding the Customer:</b>	Making the effort to know customers and their needs



# CUSTOMER ASSESSMENT OF SERVICE QUALITY



## CORRESPONDENCE BETWEEN SERVQUAL DIMENSIONS AND ORIGINAL TEN DIMENSIONS FOR EVALUATING SERVICE QUALITY

Original Ten Dimensions for Evaluating Service Quality	Tangibles	Reliability	Responsiveness	Assurance	Empathy
Tangibles					
Reliability					
Responsiveness					
Competence					
Courtesy					
Credibility					
Security					
Access					
Communication					
Understanding the Customer					

---

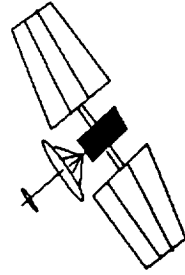
## **Deming Method - TQM**

**Changes the relationship with  
customers,  
with suppliers, with employees.**

---

# CUSTOMERS IN THE TQM PROCESS

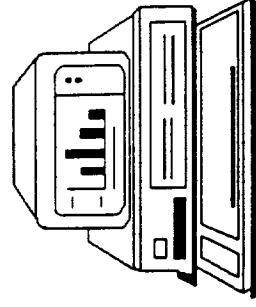
External Markets



Internal Staff



Suppliers



---

## PITFALLS ON THE ROAD TO QUALITY

---

- Managers don't understand economics, capacities, bottlenecks, sources of delay
  - Data often not available
- Contracting relationships focus on wrong measures
  - Contractors systems focus on cost recovery
- Supplier/subcontractor behavior needs to be Q oriented
  - Have common understanding
- Avoid over or underspecification - it's too costly
- Successful TQM programs find ways to recast reporting to reflect operating requirements

**A lot of what we're doing to prevent dishonesty is counter to the basic notions of Total Quality Management. We're trying to inspect honesty into the defense industry today. We have 26,000 auditors out there inspecting it in.**

**Aerospace Business  
Aviation Week & Space Technology/12/4/89**

---

## PITFALLS (Continued)

---

- Processes are institutionalized
  - Greatest opportunities to improve Q are initial front end design
- Can't Automate your way to Q
  - Adding Q to the wrong processes is a loser
- Cruise Control Syndrome - lack of cross function integration
  - Q problems result from decisions never made
- Embracing SPC in only one dimension exacerbates the problem
- Paperwork and Bureauritizing Q process
  - Successful TQ companies use less paper in programs

## **PITFALLS (Continued)**

- No single action can replicate accomplishments of a TQ company
  - Many small changes change culture
- Visions don't translate into action until worker understand concrete changes required of them.
  - Use existing skills differently
  - Gain new skills



**"No one likes to go  
home and say they  
made junk all day."**

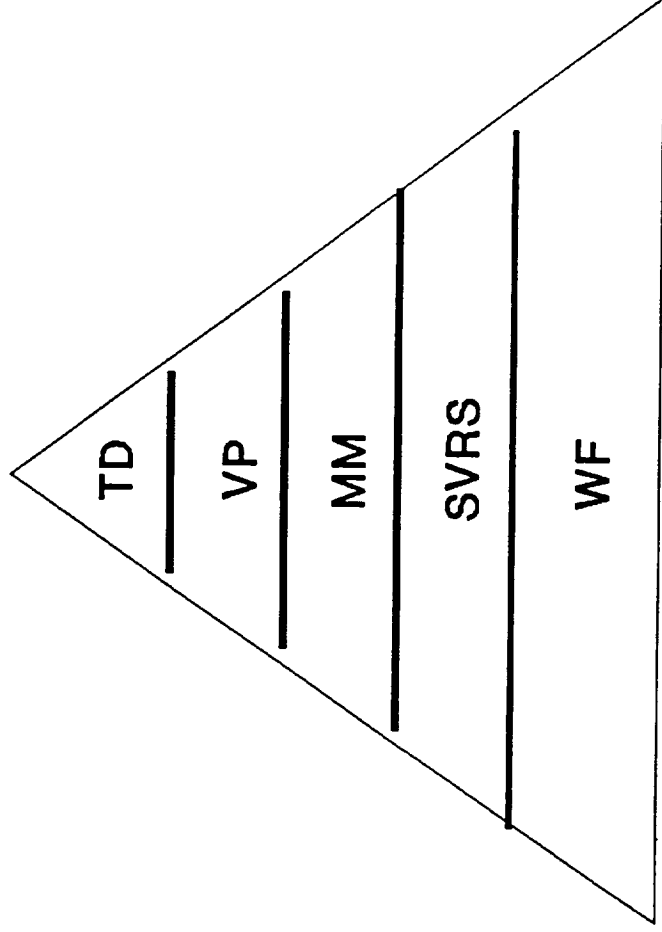
- UAW Spokesman

Technology Review  
7/20/90

## QUALITY TEAM DEFINITION

A high performing group in which the job gets done with excellence and the people feel included, valued and appreciated.

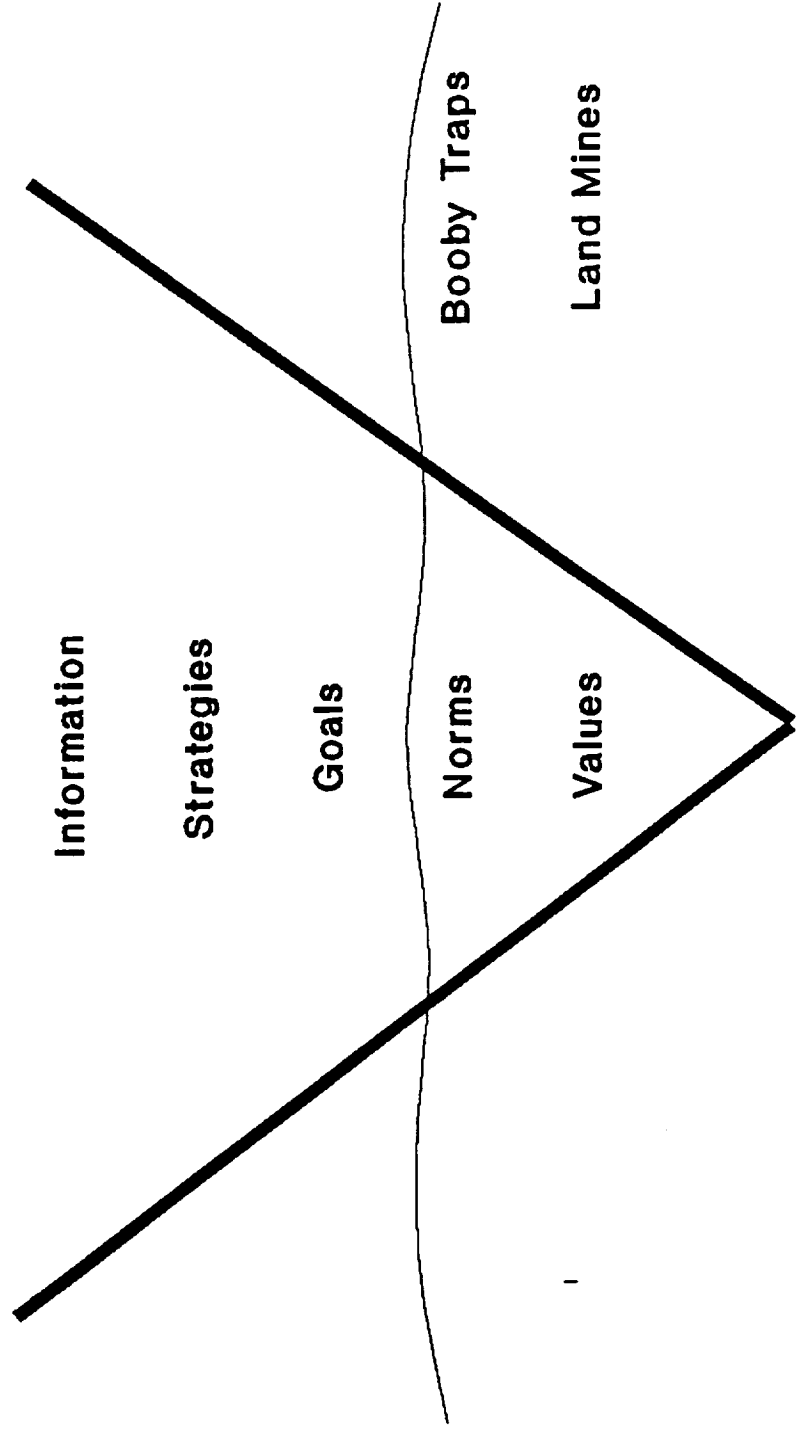
# THE THOUGHT PARADIGM



Can Think

Can't Think

# TYPES OF CONFLICT



## FAD OR FACT

- Ford "Quality Is Job 1"
  - Donald Peterson retired Chair is Deming disciple

"Those enterprises that don't adopt a quality culture simply are not going to succeed."
- Big companies are increasingly demanding suppliers organize and executive along, these principles.
  - One major money center bank is looking at commitment to TQ as determining factor in evaluating company's risk.  
(Oliver)
- Malcolm Baldrige National Quality Award
  - "The process refocuses companies and makes them look hard at themselves. Gives them a level of understanding of what's good and bad."

---

## 8 CRITERIA FOR MALCOLM BALDRIGE NATIONAL QUALITY AWARD

---

- A plan to keep improving all operations continuously.
- A system for measuring these improvements accurately.
- A strategic plan based on benchmarks that compare the company's performance with the world's best.
- A close partnership with suppliers and customers that feeds improvements back into the operation.
- A deep understanding of the customers so that their wants can be translated into products.
- A long-lasting relationship with customers, going beyond the delivery of the product to include sales, service, and ease of maintenance.
- A focus on preventing mistakes rather than merely correcting them.
- A commitment to improving quality that runs from the top of the organization to the bottom.

- Curt W. Reiman  
Fortune 4/23/90

## FAD OR FACT (Continued)

- In DoD aerospace the commitment shows no signs of waning
- November 1989 "First National Total Quality Management Symposium"
  - DoD
  - AIAA
  - National Security Industrial Association
  - American Defense Preparedness Association

850 attended - double expectation highest levels of government and industry. Aerospace and defense executives stressed strong convictions that it's here to stay

- Skeptics must discard doubts and embrace the concept or be left behind.
- Aerospace customers and suppliers are hearing about it
  - Aviation Week and Space Technology

---

## FAD OR FACT (Continued)

---

BUT, CHANGING TO TQM CULTURE IS FRUSTRATING AND EXPENSIVE  
WITH HIGH FRONT END COSTS

- Complete shift away from short-term perspectives
- CEO and bottom line oriented financial officers switch to long term view
  - Requires strong outside motivation
- Change is inherently disruptive
  - Test skills and intuition of even most committed
- Sr. Managers must accept time frame and commitment required
- And smart competitors don't sit still



---

## QUALITY OR PRICE?

---

While price still plays an important role in buying decisions, more customers demand high quality at any price level.

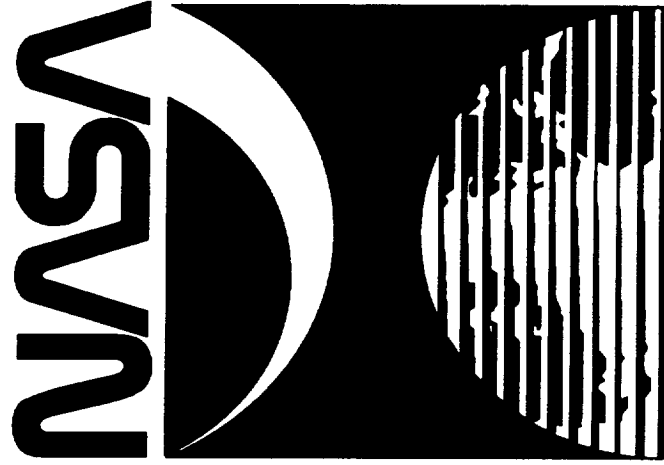
	Quality more important than price
1988	80%
1978	30%

- Leading quality consulting firm in Mass.

Time 11/13/89



COORDINATING COUNCIL MEETING



# STI PROGRAM SCIENTIFIC & TECHNICAL INFORMATION

JULY 91

NASA Center for Aerospace Information

**COORDINATING COUNCIL MEETING**

# **WHAT HAS CASI DONE TO IMPROVE QUALITY?**

JULY91

**NASA Center for AeroSpace Information**

## Database Quality

- Accuracy
- Completeness
- Timeliness
- Retrievability
- Perception

## **INPUT PROCESSING**

- **Machine-Aided Indexing**
  - Real-Time Interactive Tool for A/I Staff
  - Enhanced Thesaurus Term Selections
  - Applied to Selective File Series
  - Increase Term Selection for Retrieval
  - Quality Aid to Title and Abstract (Spell Check)

- **Machine-Aided Duplicate Check Enhancement**
  - Increases Reliability and Accuracy
  - More Thorough Analysis of Author and Title Data
  - Eliminates Errors Associated With Repetitive Manual Processes

JULY91

## **COORDINATING COUNCIL MEETING**

- **Cataloging Standardization**

- Active Participation in CENDI Cataloging Committee
- Standardized Contract Number Format
- Machine-Aided Corporate Source Code Selection
- Report Documentation Page

JULY 91



## **COORDINATING COUNCIL MEETING**

- **Database Changes and Correction**

- Proof and Review Prior to Database Load
- Retrospective Indexing
- Correcting/Changing Data Element to STIMS Record (Internally/Externally Identified)  
3-4K Year
- Post STAR Review
- Notification to User Activities - NTIS / ESA / AIAA

JULY91

**NASA Center for AeroSpace Information**

## **COORDINATING COUNCIL MEETING**

- **Foreign National Level Interaction**

- CISTI, NASDA, ISA, ADIS
- Training, Evaluation, Communication, Feedback

JULY91

**NASA Center for AeroSpace Information**

- **Improved and Revitalized Authority Tools**
  - Special Input Processing Manual for NATLEV
  - Corporate Source Authority
  - Acronym Dictionary

JULY91

STI PROGRAM COORDINATING COUNCIL

# STI PROGRAM COORDINATING COUNCIL

JULY 1, 1991

PRESENTED BY NASA LARC  
GEORGE RONCAGLIA

## **STI PROGRAM COORDINATING COUNCIL**

- **CURRENT PRODUCTS**
  - **PRINTED:**
    - FICHE, DOCUMENTS
    - PAPER COPIES, DOCUMENTS
    - TRANSLATIONS
    - RECON
  - **FUTURE PRODUCTS:**
    - MORE INCLUSIVE AND EASIER TO USE RECON (RECON III?)
    - FULL-TEXT CONVERSION AND ONLINE ACCESS TO STI
    - NASA OUTPUT CAPABILITY OF HANDLING R&D AS WELL AS R&PM CHARGE-BACKS FOR SERVICES

## **STI PROGRAM COORDINATING COUNCIL**

- FICHE, DOCUMENTS
  - ORIGINAL FICHE QUALITY VERY UNEVEN
  - MULTIPLE COPY ORDERING ON ONE ORDER IS NOT WORKING
  - NO WAY OF MEASURING TIMELINESS OF RECEIVALS SINCE STAFF IS NOT AWARE OF WHEN DISTRIBUTIONS SHOULD HAVE BEEN RECEIVED

**FICHE ON DISTRIBUTION ARRIVE WEEKLY**

## STI PROGRAM COORDINATING COUNCIL

- PAPER COPIES, DOCUMENTS
- HARD COPIES RECEIVED WITHIN 1 WEEK OF REQUEST
- DELAYED RECEIPTS DUE TO 'MULTIPLE REPRODUCTION ATTEMPTS' (PER INVOICE)

### TIME SPAN OF 9-40 DAYS

- QUALITY OF HARD COPIES FROM FICHE UNEVEN. MOST COPIES GO OUT WITH 'BEST AVAILABLE COPY' STAMP
- BILLING SEEMS TO BE IMPROVING IN TERMS OF TIMELINESS. CORRECTED INVOICES RECEIVED BY CENTER AFTER A PREVIOUS INVOICE CAUSE MAJOR PROBLEMS AND ARE NOT AN ACCEPTABLE METHOD OF BILLING

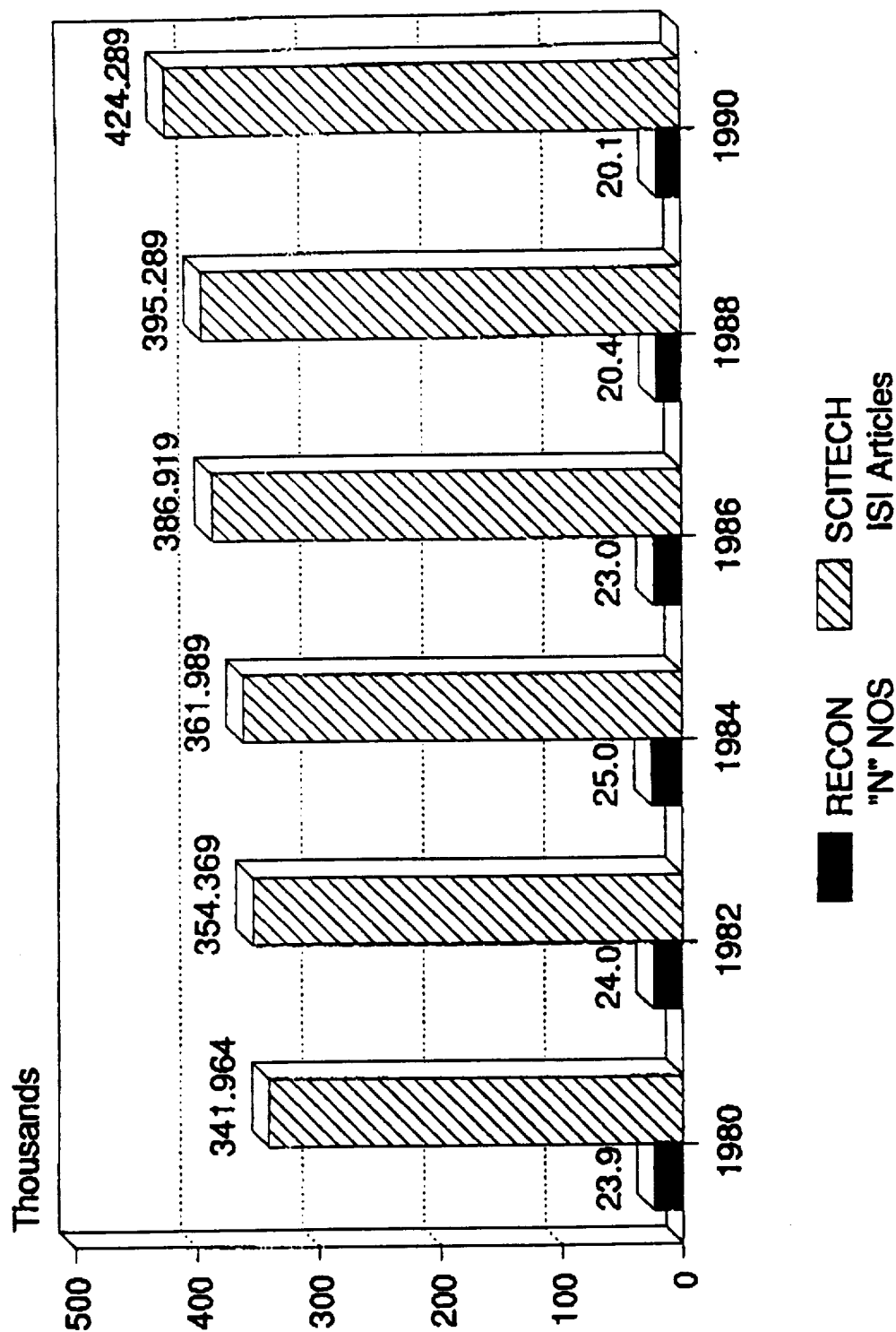
## STI PROGRAM COORDINATING COUNCIL

- RECON
  - COVERAGE IS SLIPPING, PARTICULARLY SO COMPARED TO INCREASED PUBLISHING OUTPUT AND RELEVANT SUBJECT FIELDS
  - LACK OF ENHANCEMENTS USEFUL IN OPERATIONAL ENVIRONMENTS
    - E.G., CAPABILITY TO PRINT MORE THAN ONE SCREEN AT A TIME IN DEDICATED COMMUNICATION MODE

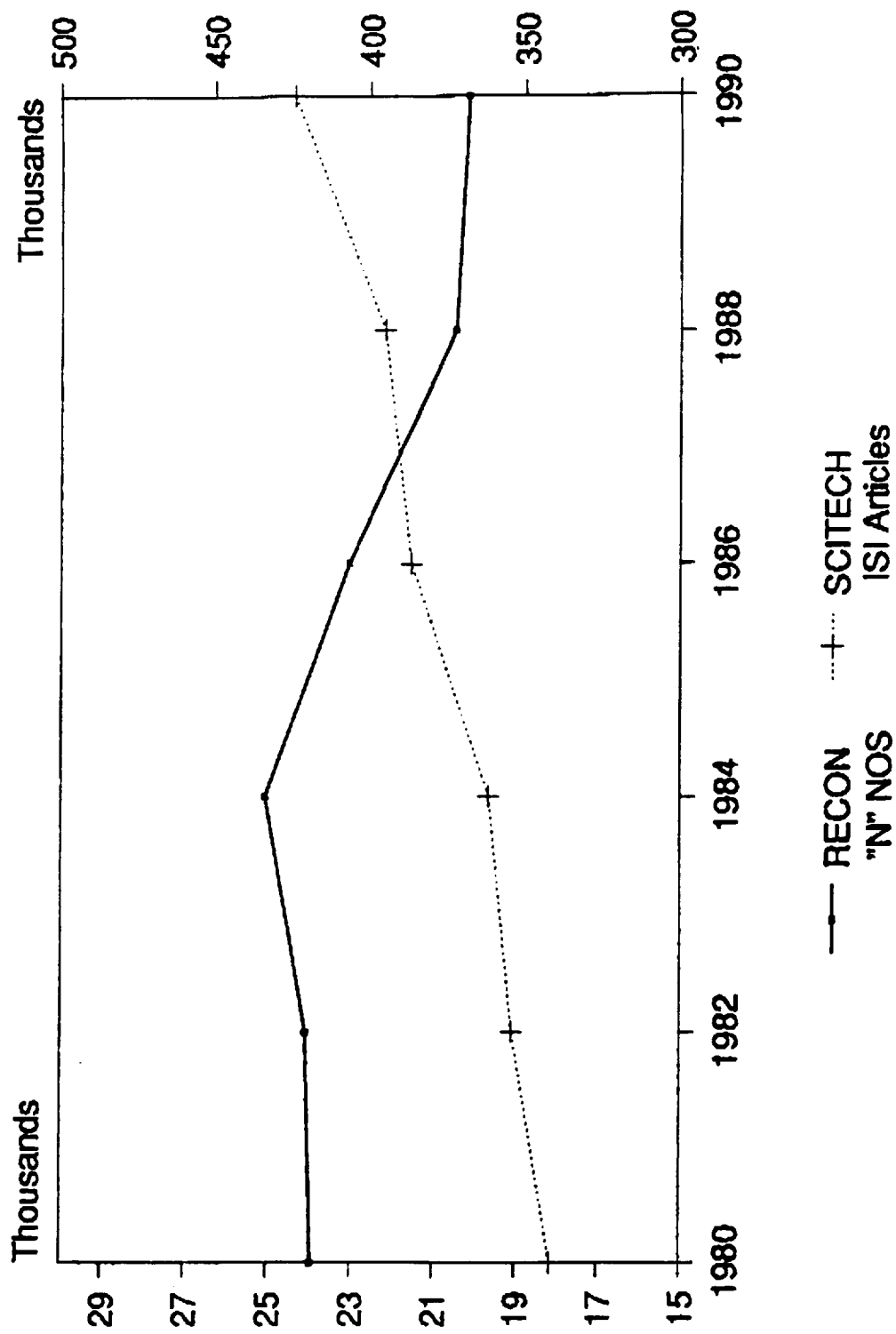


- RECON (CONTINUED)
- LIMITATION/CLASSIFICATION INFORMATIONAL GAPS
- ITEMS SUBMITTED FOR INCLUSION TO SYSTEM NOW TAKE 6.5 MONTHS VERSUS 4 MONTHS IN 1988
- 10% ERROR RATE OCCURED WITH DOCUMENTS CATALOGED ALSO AT LARC APPROXIMATELY 50/500 DOCUMENTS. CORRECTIONS SENT TO FACILITY, SOME LATER RE-SUBMITTED SINCE NOT CORRECTED THAT YEAR

# RECON Input vs. SCITECH Output 1980 - 1990



# RECON Input vs. SCITECH Output 1980 - 1990



## **STI PROGRAM COORDINATING COUNCIL**

- **FUTURE PRODUCTS:**
  - **MORE INCLUSIVE AND EASIER TO USE RECON**
  - **THE ONE REALLY UNIQUE ELECTRONIC NASA STI PRODUCT**
  - **USE IS LIMITED OUTSIDE OF NASA**
  - **POTENTIALLY A MUCH IMPROVED TOOL FOR NASA INTERNAL AND TO MOVE STI TO THE OUTSIDE**
  - **FULL-TEXT CONVERSION OF STI OUTPUT AND ACCESS TO THAT OUTPUT**
  - **MECHANISMS TO HANDLE BOTH R&D AND R&PM CHARGE-BACK FUNDS (IF NOT ALREADY IN PLACE)**

## Database Quality: User Views Test Producer Perceptions

Barbara Lawrence

AIAA

July 1, 1991

A presentation to the NASA STI Coordinating Council

Quality has always been a hallmark of the NASA STI database. However user expectations for databases have changed, as has the technology of database building and information retrieval. This presentation reviews our understanding of current user expectations for a quality database and tests the NASA STI database against these expectations. User needs are briefly characterized, as are user defined database quality characteristics. Specific aspects of the NASA STI database are then discussed. The conclusions are that there is room to improve database quality and that, as a multiparty-built file, cooperation and communication are key to database quality.



# Handouts for: Database Quality

## Database Quality: User Views Test Producer Perceptions

Barbara Lawrence

AIAA

July 1991

### Quality

#### ■ An Issue

- A hot topic among users
- A litigious society
- Use of multiple databases
- NASA database built cooperatively

#### ■ An Attitude

- Cooperation and communication
- Work smart
- Guidelines and standards

Database Quality - AIAA

2

### Background

#### Customer contact

- Customer service
- Exhibits

#### Generic

- NFAIS 1990 conference and 1991 working group
- SCOUG
- Literature

Database Quality - AIAA

3

## Handouts for: Database Quality

### Users: Quality Needed

- Intermediaries
  - Detailed needs
  - Push producer and host
- End Users
  - Want info, not process
  - Telecommunications the hard part
  - Need guidance query formulation, database selection

Database Quality - AIAA

4

### Users: Quality Needed

- Aerospace Scientists and Engineers
  - Understand concepts of databases and retrieval
  - Not intimidated by technology
  - Need problem solving information
  - Need it on their time table

Database Quality - AIAA

5

### Quality: Who's talking?

- Aitchison: 1988 Miles Conrad Lecture
- Potzcher: user needs
- Maxon-Dadd: DIALOG experience
- Mintz: a thoughtful user
- SCOUG: a user group
- NFAIS : task force

Database Quality - AIAA

6



## Handouts for: Database Quality

### Users: Information Retrieval Environment Changes

- Expectations change: a history
  - having a database
  - errors
  - indexing
  - complete review
- Effectiveness = use of info, as well as usefulness
- Retrieval system is part of the equation

Database Quality - AIAA

7

### Quality Characteristics: Generic

- Accuracy
- Comprehensiveness
- Consistency
- Timeliness
- Accessibility
- Support
- Cost/Value
- TQM

Database Quality - AIAA

8

### Data Quality and the NASA Database

- Accuracy
  - Errors corrected on RECON
  - Errata, not handled
  - Data elements complete
  - Errors introduced in transformations
- Comprehensiveness
  - Covers all literature types
  - Source evaluation and selection
  - Has been resource limited
  - Abstracts truly informative

Database Quality - AIAA

9

## Handouts for: Database Quality

### Data Quality and the NASA Database

- Consistency
  - Thesaurus
  - Indexing
  - Codes
  - Subject classification
  - Hot topics
- Timeliness
  - Suits the literature
  - Currency varies

Database Quality - AIAA

10

### NASA STI DATABASE: Data Elements with Quality Issues

- Authors
- Author affiliations
- Subject categories
- Country codes
- Note/citations
- Typos

Database Quality - AIAA

11

### NASA STI DATABASE: Fields to Consider

- ISBN
- CODEN
- Treatment Codes
- Specialized indexing
- Pre 1972 abstracts
- Trade Names

Database Quality - AIAA

12

## Handouts for: Database Quality

### NASA STI DATABASE: Fields to Reconsider

- Corporate source codes
- Sales prices
- Internal to NASA
- Number of analytic subsidiaries

Database Quality - AIAA

13

### CONCLUSION

- A good database, with room for upgrading to current expectations and to take advantage of today's retrieval systems
- The multiparty environment will multiply the challenges
- Setting and constantly reviewing guidelines is needed; evaluation and training too
- Continuous improvement = TQM = DQM

Database Quality - AIAA

14

### Quotation

“ The quotation marks in this quotation are 48 point Zapf Dingbats and the text itself is 24 point Helvetica Bold. We used the Label tool to create separate Zapf Dingbats so we could position them without extra space between lines.”

Database Quality - AIAA

15

## DATABASE QUALITY

### A Selected Bibliography

Aitchison, T.M. (1988). Aspects of Quality. Miles Conrad Memorial Lecture, NFAIS Newsletter, 30(2) (April)

Basch, Reva (1990). Measuring the Quality of the Data: Report on the Fourth Annual SCOUG Retreat. Database Searcher (October 1990), 18-23.

Kuhlthau, Carol C. (1991) Inside the Search Process: Information Seeking from the User's Perspective. JASIS, 42(5): 361-371.

Lawrence, Barbara (1990). Database Publishers' Challenges for the Future. Information Services and Use, 10(10990) 293-304.

Maxon-Dadd, Josephine (1990). Refurbishing an Elegant Victorian Database - A View from DIALOG. IN: W. Shipper and Betty Unruh, eds., Trends in Database Design and Customer Services. NFAIS, Philadelphia

Mintz, Anne P. (1990). Quality Control and the Zen of Database Production. Online (Nov).

Potzcher, Gunter and A.J.C. Wilson (1990). User Needs in Chemical Information. J. Chem. Information Computer Science. (30), 169-173.